Federal Aviation Administration

Software Applications and Operating Systems

Introduction

Section 508 was enacted to:

- Eliminate barriers in information technology
  - Example: Navigate Contact Form using keyboard or a screen reader to demonstrate inaccessibility
- Make available new opportunities for individuals with disabilities
- Encourage development of technologies that will help achieve goals
- Ensure Assistive Technology and Information Technology Compatibility

Training Objectives

- To Understand and Apply the accessibility requirements of 1194.21
- To Review the Accessibility Features of the Java Software Application
- To Become Aware of the Gnome Accessibility Project and the UNIX operating system
- To Become Familiar with Microsoft Active Accessibility features

Training Agenda

- Part 1: Access Board Software Applications and Operating Systems Technical Standards (1194.21)
- Part 2: Accessibility Features of Software Applications and Operating Systems
  - Java
  - UNIX (Gnome Accessibility Project)
  - Microsoft (Microsoft Active Accessibility)

Developing Accessible Software

- Definition:
  - Application Software is executable code written in any programming language that produces a viewable or interactive interface. Application Software includes plug-ins and multimedia but excludes HTML client-side scripting and meta languages.

Developing Accessible Software (cont)

- Identify accessibility requirements of 1194.21 technical provisions
- Demonstrate how each of the 1194.21 technical provisions are applied
- Explore the Accessibility of SF Calculator, a Six-function calculator which is an accessible software application

1194.21(a): Executing Function from Keyboard
1194.21(d): User Interface Element

Provisions 1194.21 (a) & (d)

- Definitions:
  - 1194.21(a): When software is designed to run on a system that has a keyboard, product functions shall be executable from a keyboard where the function itself or the result of performing a function can be discerned textually.

Provisions 1194.21 (a) & (d) (Cont)

- Definitions (cont)
  - 1194.21(d): Sufficient information about a user interface element including the identity, operation and state of the element shall be available to assistive technology. When an image represents a program element, the information conveyed by the image must also be available in text.

Provisions 1194.21 (a) & (d) (cont)

- Technical Provision (a): Keyboard Access
  - Applies to providing keyboard functionality in programs
    - All functions must be keyboard accessible
  - At least one alternative keyboard method for any function must be available
    - Tabbing
    - Access Keys
    - Menu

Provisions 1194.21 (a) & (d) (Cont)

- 1194.21(d) is a prerequisite to 1194.21(a)
  - To be able to access user interface elements they must first be identifiable
- Requirements:
  - text must be associated with each element
  - text must identify the element and its current state or condition.

Provisions 1194.21 (a) & (d) (Cont)

Keyboard Access & Object Information

- Demonstrate alternative keyboard methods and object identification
  - Open a screen reader and SF Calculator
  - Tab through the form (note that the screen reader will identify each user interface element, except for label elements)
  - Use Access Keys to navigate form
  - Use File Menu to access form functions

Provisions 1194.21 (a) & (d) (Cont)

Keyboard Access & Object Identification

- Tabbing Method
  - Definitive keyboard means of accessing and executing program functions
  - Definitive means of accessing the results of program functions
  - Tab Key and Shift + Tab Keys to move from control to control

Provisions 1194.21 (a) & (d) (Cont)

Keyboard Access & Object Identification

- Access Keys
  - Utilize specific keystrokes (ALT +?) for command execution
  - Definitive and quick keyboard means to access and execute program functions
  - Definitive means to access results of program functions
  - Check to make sure that Access Key does not interfere with an assistive technology key commands

Provisions 1194.21 (a) & (d) (Cont)

Keyboard Access & Object Identification

- File Menu
  - Application functionality in pull-down menu structure
  - Select and activate any one of the program commands using ALT, Arrow and/or ESC keys
  - Requires at least one Access key to access the file menu
  - If input fields are used, requires a tabbing method to access input field.

Provisions 1194.21 (a) & (d) (Cont)

Keyboard Access & Object Identification

- Object Identification
  - User Elements: include button checkboxes, menus, toolbars, scroll bars, and any other feature of a program that is intended to allow the user to perform some action
  - text must identify the element and its current state or condition
    - Example: Checkbox – must state whether checkbox is checked or not

Provisions 1194.21 (a) & (d) (Cont)

Keyboard Access & Object Identification

- Object Identification
  - Text:
    - Use edit control, static text (i.e., text with a window handle), and RichEdit (RichEdit does not use Active Accessibility)
    - Use calls within the Windows operating system to output text (TextOut, DrawText, etc)
  - Menu: Use MSAAMENUINFO structure to expose the menu text to Active Accessibility, or provide a preference for using text-only menus

Provisions 1194.21 (a) & (d) (Cont)

Keyboard Access & Object Identification

- Object Identification (cont)
  - Images:
    - Provide label and descriptive text for images
    - Use tool tip to provide descriptive text
  - Control elements
    - Use tool tip or caption to provide descriptive text
    - In .Net, use “iaccessible names, iaccessible description, and iaccessible control”

1194.21(b): Accessibility Features

Provisions 1194.21(b)

- Definition:
  - Applications shall not disrupt or disable activated features of other products that are identified as accessibility features, where those features are developed and documented according to industry standards. Applications also shall not disrupt or disable activated features of any operating system that are identified as accessibility features where the application programming interface for those accessibility features has been documented by the manufacturer of the operating system and is available to the product developer.

Provision 1194.21 (b)

Accessibility Features

- Requirements apply to the interference with activated and documented accessibility features
- Applies to accessibility features that belong to:
  - Operating System
  - Another software application
- Application and Assistive technology conflicts caused by:
  - Keyboard Interference
  - Display Interference

Provision 1194.21 (b)

Accessibility Features

- **Keyboard Interference** - Application interferes with active features of assistive technology (screen reader)
  - Disabling announcement of text on designated control or screen
- **Display Interference** - Application interferes with a Windows Accessibility Option that has been engaged
  - Disabling some effects of “Use High Contrast” Mode

1194.21(c): Input Focus

Provisions 1194.21(c)

- Definition:
  - A well-defined on-screen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed so that assistive technology can track focus and focus changes.

Provision 1194.21 (c)

Input Focus

- Types:
  - System Caret (blinking vertical bar for editing)
  - Dotted Rectangle (dotted rectangle around controls and shadow on one side of the control)
  - Moving Mouse
  - Highlighted Menu Option
- Absence of Input Focus and System Caret Synchronization affects assistive technology use

Provision 1194.21 (c)

Input Focus

- Example:
  - Open SF Calculator Demonstration and navigate form controls. Notice the different types of focus as you navigate through the controls.
- System Caret:
  - Win32API allows System Caret to be manipulated so the Focus to be tracked and moved in the background
  - Focus enabled by using the Common Control Components

Provision 1194.21 (c)

- Input Focus
  - System Caret: (cont)
    - Components intrinsically employ System Caret and its related functions
    - Custom graphical carets must be synchronized with the System Caret clone

1194.21(e): Bitmap Images

Provision 1194.21(e)

- Definition:
  - When bitmap images are used to identify controls, status indicators, or other programmatic elements, the meaning assigned to those images shall be consistent throughout an application's performance.

Provision 1194.21 (e)

Bitmap Images

- Inconsistent use of program elements violates good practices in:
  - **Programming**
  - **Usability**
  - **User Interface Design**
  - **Accessible Software Design**
- Check for consistent use and meaning of bitmap images throughout the application

1194.21 (f): Textual Information

Provision 1194.21 (f)

- Definition
  - Textual information shall be provided through operating system functions for displaying text. The minimum information that shall be made available is text content, text input caret location, and text attributes.

Provision 1194.21 (f)

Textual Information

- Use:
  - standard text controls such as the edit control, static text (i.e., text with a window handle), and RichEdit
- Text Information:
  - Content apparent when command button receives Focus
  - Content and/or Caret Position when Focus is on input or edit fields
  - Designated keystrokes determine Caret Position for screen reader users

Provision 1194.21 (f)

Textual Information

- Demonstration:
  - Open SF Calculator
  - Enter text information in Input fields and then read the Input fields and command buttons

Provision 1194.21 (f)

- Screen reader must be able to identify Text Attributes by designated keystrokes
- Interferes with assistive technology when
  - Custom graphical caret is used without synchronizing the System Caret clone
  - Non-standard font is used without text character codes

1194.21 (g): User Selected Attributes

1194.21 (g)

- Definition:
  - Applications shall not override user selected contrast and color selections and other individual display attributes.

Provision 1194.21 (g)

User Selected Attributes

- Two Methods in Windows Control Panel
  - High Contrast Setting via Accessibility Options
  - Windows Appearance Scheme
- Demonstration
  - Open **SF Calculator**
  - Example 1:
    - Right click on the windows screen or activate the Windows properties dialog box
    - Select on “Properties”
    - The “Display Properties” dialog box appears

Provision 1194.21 (g)

- Example 1: (cont)
  - Select “Appearance”
  - Select the drop down box “Scheme”
  - Choose “High Contrast (Large White)”
  - The Windows color scheme and the SF Calculator Form will be changed to High Contrast (Large White)
    - If not, then the form fails this provision
- Example 2: (optional)
  - Right click on the windows screen or activate the Windows properties dialog box
  - Select on “Properties”
  - The “Display Properties” dialog box appears

Provision 1194.21 (g)

- Example 2: (cont)
  - Select “Appearance”
  - Select the drop down box “Scheme”
  - Choose a different color scheme and change the font sizes with the different Window elements
  - The Window elements and the SF Calculator Form will be change to your selection
    - If not, then the form fails this provision
- Techniques for using a custom scheme
  - Check “SysColor” attributes on application launch
  - Check for user changes in user selected attributes

Provision 1194.21 (h)

Animation

- User has option to choose Animation information by one of 2 methods:
  - Option to Skip animation
    - **Available in Non-animated format**
  - Option to Display animation
    - **Available in Non-animated format**

1194.21 (h): Animation

1194.21 (h)

- Definition
  - When animation is displayed, the information shall be displayable in at least one non-animated presentation mode at the option of the user.

Provision 1194.21 (h)

Demonstration

- Open Animation: “Section 508 Animation”
- User has a choice to
  - Skip animation
  - Not to skip animation
  - Information provided in non-animated format
- Issue:
  - The animation satisfies this provision. There is usability issue because focus is not set to the status bar to give the user the initial information to determine what is happening on the page.

1194.21 (i): Color

1194.21 (i)

- Definition
  - Color coding shall not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

Provision 1194.21 (i)

- Color shall not be the only means of
  - **Conveying Information**
  - **Indicating an action**
  - **Prompting a response**
  - **Distinguishing a visual element**
- Use of color as an indicator requires a textual indicator

Provision 1194.21 (i)

- Issues:
  - Objects that change color
    - Example: Using red for a number that changed from positive to negative
  - Using color for data validation errors
    - Example: Using a label with red text
  - Using color to illicit an action or response by color
    - Example: A folder bitmap that changes color when it has been moved

1194.21 (j):
Color and Contrast Settings

1194.21 (j)

- Definition
  - When a product permits a user to adjust color and contrast settings, a variety of color selections capable of producing a range of contrast levels shall be provided.

Provision 1194.21 (j)

- Applies to those products that already allow a user to adjust screen colors
- Provide a range of foreground and background color choices
- Does not require software to provide color and contrast settings

Provision 1194.21 (j)

Color and Contrast

- Requires a variety of color combinations for a range of contrast levels for products that provide color and contrast adjustment
- Support operating system color choices for text and background colors
- Use 16 color pallet or an equivalent

1194.21 (k): Flicker Rate

1194.21 (k)

- Definition
  - Software shall not use flashing or blinking text, objects, or other elements having a flash or blink frequency greater than 2 Hz and lower than 55 Hz.

Provision 1194.21 (k)

Flicker Rate

- Some individuals with photosensitive epilepsy can have a seizure triggered by displays that flicker, flash, or blink, particularly if the flash has a high intensity and is within certain frequency ranges
- Anyone can be subject to a photo-induced seizure.
- Stress, fatigue, or depression are some factors that can make someone photo-sensitive

Provision 1194.21 (k)

Flicker Rate (cont)

- Certain blink rates interfere with assistive technology

Example:

- **Demonstration Flicker Rate**
  - **WARNING:** If you are susceptible to seizures or start to get a headache, **STOP** this program **IMMEDIATELY**.
- Flicker Rate program increases or decreases the blink rate.

Provision 1194.21 (l)

Electronic Forms

- Forms be compatible, accessible and usable by users of assistive technology
- Forms meet this requirement if:
  - **Keyboard alternatives for navigation**
  - **Descriptive text labels**
  - **All elements of form (fields) completed**
- No part of the form must violate any of the other (a) – (k) requirements

Provision 1194.21 (l)

Electronic Forms

- Demonstration of Contact Form
  - Navigate form
  - Check Access Keys
  - Check Contrast Mode
  - Title “label” has been replaced with READ-ONLY Textbox
  - Response “label”, submit button, has been with Windows dialog box.

Software Applications and Operating Systems Resources

- **MICROSOFT**
  - Microsoft Accessibility: http://www.microsoft.com/enable/default.htm
  - Microsoft Accessibility for Developers (MSDN Area): http://www.msdn.microsoft.com/library/default.asp?url=/nhp/Default.asp?contentid=28000544
  - Visual Basic (DOC) Visual Basic (HTML)
  - Visual C++ (DOC) Visual C++ (HTML)

Software Applications and Operating Systems Resources

- **JAVA**
  - JAVA Coding Tips and Techniques (DOC)
    - JAVA Coding Tips and Techniques (HTML)
  - JAVA Coding Standards (DOC)
    - JAVA Coding Standards (HTML)
  - Sun Java Accessibility Site (text version): http://java.sun.com/products/jfc/jaccess-1.3/doc/index.html

Software Applications and Operating Systems Resources

- JAVA (cont)
  - Sun Java Foundation Classes: http://java.sun.com/products/jfc/
  - Sun Accessibility Program: http://www.sun.com/access/general/overview.html
  - Java Accessibility for Developers: http://www.sun.com/access/developers/index.html

Software Applications and Operating Systems Resources

- **ORACLE**
  - Oracle Tips and Techniques (DOC)
    - Oracle Tips and Techniques (HTML)
  - Oracle Accessibility Program: http://www.oracle.com/accessibility.faq.html

UNIX Accessibility

Gnome Accessibility Project

- Gnome 2.0 – Accessible Desktop Solution
- Accessibility Toolkit Application Programming Interface
- Assistive Technology Service Provider Interface
- User Interface Guidelines and Checklist for Supporting Accessibility

Software Applications and Operating Systems Resources

- **GNOME**
  - GNOME Accessibility for Developers: http://developer.gnome.org/projects/gap/guide/gad/index.html
  - Accessibility Design Guidelines: http://developer.gnome.org/projects/gap/hi-design.html
  - Assistive Technologies: http://developer.gnome.org/projects/gap/at-types.html